# BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

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## TECHNICAL SPECIFICATION FOR 11KV ISOLATOR 400A DOUBLE BREAK

**1.0 SCOPE**:

This specification covers the design manufacture, testing at manufacturer's works and supply of 11KV Isolator Double break 400 Amps. Capacity complete manual operating mechanism air break disconnects (Isolators) and complete in all respect with PG Clamp connectors and other accessories such as operating pipe, connecting pipe guides, supporting insulators and locking arrangement etc., complete set conforming to IS-9921(Part 1 to 5) and enclosed its typical drawings.

**2.0 STANDARDS:**

The isolators shall comply with the requirements of IS 9921 (as amended up to date & time to time) and the latest edition of IS/IEC 62271-102 (IEC 60129). The Insulators shall comply with the requirement of latest edition of IS 2544/1973 and IEC 60168/1988 (as amended up to date & time to time)

| Sl.No. | Standard No. | Title |
|---|---|---|
| 1 | IS 9921 (Part 1 to 4) | Alternating Current Disconnectors (Isolators) and Earthing Switches for Voltages Above 1000 V - Part I |
| 2 | IEC 62271-102 (IEC -60129) | Alternating current disconnectors and earthing switches |
| 3 | IEC 62271-1 (IEC 60694) | High-voltage switchgear and control gear - Part 1: Common specifications |
| 4 | IS 2544/ IEC 60168 | Porcelain post insulators for systems with nominal voltage greater than 1000 Volts |
| 5 | IS 5350 | Dimensions of Indoor and Outdoor Porcelain Post Insulators and Post Insulator Units for Systems with Nominal Voltages Greater than 1000 V |
| 6 | IS 808 (1989) | Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections |
| 7 | IS 2629 | Recommended Practice for Hot-Dip Galvanizing of Iron and Steel |
| 8 | IS 4736 | Hot-dip Zinc Coatings on Mild Steel Tubes |
| 9 | IS 4759 | Hot-dip zinc coatings on structural steel and other allied products |
| 10 | IS 6745 | Method for determination of mass of zinc coating on zinc coated iron and steel articles |
| 11 | IS 2633 | Methods for testing uniformity of coating of zinc coated articles |
| 12 | IS 6735/1994 | Spring lock washers |
| 13 | IS 2016 | Plain washers |
| 14 | IS 1161 | Steel tubes for structural purposes |
| 15 | IS 1239-1 (2004) | GI pipe('B' class or Medium class) |
| 16 | IS 2147 | Degree of protection provided for enclosures for low voltage control gear |
| 17 | IS:4691 | Degree of protection provided by enclosures for rotating electrical machinery |
| 18 | IS: 5561 | Electrical Power Connectors |

**3.0 WEATHER CONDITIONS**:

The Isolators supplied shall be suitable for satisfactory continuous operation under weather conditions as specified below:

| Sl.No. | Particulars | Value |
|---|---|---|
| 1 | Maximum ambient temperature | 50ºC |
| 2 | Minimum ambient temperature | -5º C |
| 3 | Relative humidity | 0 to 100% |
| 4 | Average annual rainfall | ≤1000 mm |
| 5 | Max. Altitude above mean sea level | ≤1000 m (3300Ft) |
| 6 | Isoceraunic level (Max) | ≤50 Days |
| 7 | Seismic level | 0.25 g |
| 8 | Max. wind speed | ≤ 39 m/s |

## 4.0 SYSTEM PARAMETERS AND TECHNICAL REQUIREMENTS

The Isolator must be able to operate under the system parameters mentioned in this specification: The equipment covered in this specification shall meet the technical requirements listed below. The Isolator must be Double Break, center pole rotating type.

| Sl.No | Particulars | Value |
|---|---|---|
| 1 | Nominal system voltage | 11kV |
| 2 | Highest system voltage | 12kV |
| 3 | Frequency | 50Hz |
| 4 | Rated normal current | **400 Amps** |
| 5 | Grounding of neutral | Solidly earthed |
| 6 | a) Unit description (as per ISS:5350/Part-III/1971) | E-22 (Except torsion strength as specified) |
| | b) Mechanical strength as per clause 3.2 of IS:5350/Prt-III/1971 | Strength class ‘C’ 7.5 to 12KN |
| 7 | Rated Insulation Level | |
| | a) To earth and between poles | 75 kV (Peak) |
| | b) Across Isolating Distance | 85 kV (Peak) |
| 8 | Rated one minute power frequency withstand test Voltage | |
| | a) To earth and between poles | 28 kV |
| | b) Across Isolating distance | 32 kV |
| 9 | Rated short circuit withstand current | 10kA |
| 10 | Rated duration of short circuit | 3 Secs |
| 11 | Rated Peak Withstand Current | 25kA |
| 12 | Creepage distance of Insulator | 320mm |
| 13 | Min. Center distance between Poles | 920mm |

| | | |
|---|---|---|
| | (Center to Center) i.e. Phase to Phase clearance | |
| 14 | Distance between center lines of outer posts on same pole | 560mm |
| 15 | Type of break | Horizontal, Double break. |

## 5.0 CONSTRUCTION:

5.1 The base shall be made of robust rolled M.S. Channel Section of size 75 x 40 mm as per IS 808 (1989) table 4.2 and thickness not less than 4.8mm. All ferrous parts shall be hot dip galvanized and all copper parts shall be Silver Plated. The rotating shall be fitted with suitable bearings.

5.2 The blades and contacts shall be of best quality electrolytic copper and shall be capable of carrying rated current continuously without exceeding the temperature limits specified in Table 41 IS:9921 (Part-II)

5.3 The insulators shall be of post type, brown glazed porcelain pedestal part type design E22 as per IS 5350 (Part-III)/1971 with cap screws and spring washers and as per technical specifications enclosed conforming to IS 2544 of 1973 with amendments thereof. The insulators baked in temperature controlled kilns only shall be used. The insulator used shall be as per relevant IS and as approved by BESCOM.

5.4 The operating pipe shall consist of Tandem Operating Pipe of length 2450mm and vertical pipe of length 5400 mm. The pipes shall Nominal Bore (NB)-25 mm Outer diameter 32mm (Approx) of class 'B' (Medium Class). The G.I pipe used shall conform to IS:1239 (Part-1): 2004, Clause 8.1, Table-4 Dimensions and Nominal Mass of Steel Tubes — Medium and amendments thereof. A guide to the vertical pipe of the operating pipe shall be provided to arrest its lateral movement. Necessary fixtures for fixing the guide to the pole shall also be supplied.

5.5 The Tenderer shall clearly indicate in the tender, the Brand name of the insulators used in manufacture of 11kV 400 Amps Double Break Isolator along with relevant type test reports failing which, the offer will not be considered. The successful bidder should get the insulator make approved by BESCOM, before making supplies.

5.6 PG Clamp suitable for ACSR Coyote shall be provided for connecting conductor to the copper flats in the Isolator.

5.7 All the Iron parts shall be hot dipped Galvanized and shall conform to the relevant IS specifications with latest amendments thereof.

5.8 **ARCING HORNS:** The switches shall be supplied with hot dip galvanized arcing horns so that while opening/closing the Isolator and arcing takes place between arcing horns not between the contacts.

5.9 **LOCKING ARRANGEMENT:** Suitable locking arrangement shall be provided for arresting the operating handle.

## 6.0 QUALITY ASSURANCE PLAN:

The bidder shall invariably furnish following information along with his offer, failing which his offer shall be rejected.

1. List of raw materials and tests normally carried out on raw materials along with copies of such test certificates.
2. Information and copies of test certificates as above, in respect of bought out items.
3. List of manufacturing facilities available with Bidder, in his premises.

4. Level of automation achieved and list of areas where manual processing exists.
5. List of areas in manufacturing process, where stage inspections are carried out for quality control with details of such tests and inspections.
6. List of testing equipment / facilities with valid calibration, available with the bidder for testing as per relevant IS.

The Purchaser reserves the right for factory inspection to verify the facts quoted in the offer. If any of the facts found misleading or incorrect, the offer shall be out rightly rejected without assigning any reason.

**7.0 WORKMANSHIP:**

1) All members as per Bill of material (BOM) & Drawings shall be made from single piece of MS Angle and dimensions as per BESCOM approved drawings.
2) There shall not be any sharp edges in final product.
3) All welding shall be done as per relevant standards for use of 11 KV line stresses and welding shall be continuous
4) Quality and strength shall not be sacrificed.
5) All holes, cutting & welding process shall be as per dimension in finished product before the galvanization process without oversizing.
6) Finished fabrication shall meet general workmanship quality.
7) All supply shall be made from uniform material
8) Hot Dip galvanization shall be done after completely finishing of the process of cutting, welding, bending, punching holes etc.,
9) The manufacturer shall obtain GTP & drawing approval before mass production from BESCOM QS&S section.

**8.0 TEST:** The manufacturer shall furnish the Type Test reports test conducted at CPRI/ERDA. The date of type test shall not be older than 5 years. The manufacturer shall have adequate testing facilities to conduct the routine and acceptance tests.

**8.1 TYPE TEST:** The following shall constitute type tests.

1) Impulse voltage dry test
2) Power frequency voltage dry test.
3) Power frequency voltage wet test
4) Temperature rise test
5) Measurement of Resistance
6) Test for rated peak short circuit current
7) Mechanical endurance tests.
8) Operation test

**8.1 ROUTINE TEST:** The routine tests as per IS 9921-Part4: 1985 shall be conducted on each Isolator.

1) High Voltage test upto 28kV withstand for one minute.
2) Measurement of resistance.
3) Dimensional Verification.
4) Mechanical operating Test

**8.2 ACCEPTANCE TEST:** acceptance tests to be conducted as per relevant IS and this specification shall be carried out at the original manufacturers works.

1. High Voltage test upto 28kV withstand for one minute.
2. Measurement of resistance.
3. Dimensional Verification.
4. Visual Examination.
5. Mechanical operating Test.

## 9.0 RANDOM SELECTION AND TESTING (RST):

As and when the material lot supplied to the BESCOM stores, a random selection of samples as per norms from the lot shall be selected in presence BESCOM official and third party inspection Engineer as nominated by BESCOM. The selected sample shall be mandatorily conducted the Type tests/Routine test/Acceptance Test as insist by BESCOM. Type test/Routine test/Acceptance Test shall be conducted at CPRI, Bangalore at the cost of the BESCOM. If any defect or abnormalities found in the tested samples then the inspection officer should reject the entire the lot which is being supplied to the BESCOM

## 10.0 NAME PLATE:

The Isolator shall be provided with the name plate legibly and indelibly marked with the following information:

1. Name of materials
2. Name of the manufacturer/Trade Mark
3. Name of the Purchaser that is the letters (BESCOM)
4. Purchase order No. and Date
5. Rated Voltage
6. Rated Current

## 11.0 TECHNICAL SPECIFICATION FOR 11KV PEDESTAL POST INSULATORS

### 11.1 GENERAL REQUIREMENTS:

The Tenderer shall clearly indicate in the tender, the Brand name of the insulators used in manufacture Isolator along with relevant type test reports failing which, the offer will not be considered. The successful bidder should get the insulator make approved by BESCOM, before making supplies.

11.2 The porcelain shall be round, free from defects, thoroughly vitrified and smoothly glazed, the glaze on insulators shall be brown in colour and should cover all exposed porcelain parts except those areas which serve as supports during fixing are required to be left unglazed as detailed in **IS:2544-1963.**

11.3 Precaution shall be taken during design and manufacture to avoid the following:

a) Stress due to expansion and contraction which may lead to deterioration.
b) Stress concentration due to direct engagement of the porcelain with the metal fittings.
c) Retention of water in recesses of metal fittings and shape which do not facilitate easy cleaning by normal methods.

11.4 All metal parts except those of stainless steel shall be hot dip galvanized after machining zinc coating shall satisfy the requirement of relevant IS specification. The finished galvanized surface shall be smooth.

11.5 The threads of the tapped holes on the post insulator metal fittings shall be cut after galvanizing and shall be protected against rust by greasing or other similar means. All other threads shall be cut before galvanizing.

11.6 The post insulator unit shall be assembled in a suitable jig to ensure the correct positioning of the top and bottom metal fittings relative to one another. The faces of the metal fittings shall be parallel and at right angles to the axis of the insulator and the corresponding holes in the top and bottom metal fitting shall be in vertical plane containing the axis of the insulator.

11.7 **Technical Particulars**: Individual Units of 11kV stacking units.

| Sl.No. | Particulars | Values |
|---|---|---|
| 1) | Rating | 11KV |
| 2a) | Unit description (as per ISS:5350/ Part-III/1971) | E-22 (Except torsion strength as specified) |
| 2b) | Mechanical strength as per Clause 3.2 of IS:5350/ Prt-III/1971. | Strength class 'C' 5kN |
| 3 | Highest system voltage | 12 KV (rms) |
| 4 | Impulse withstand voltage | 75 KV (peak) |
| 5a) | One minute Power frequency withstand **Dry** | 55 KV (rms) |
| 5b) | One minute Power frequency withstand **Wet** | 35 KV (rms) |
| 6 | Power Frequency Puncture withstand voltage (rms) | 1.3 times the actual dry flash over voltage of the unit. |
| 7 | Visible Discharge test voltage | 9 KV (rms) |
| 8 | Creepage distance Minimum | 320 mm |
| 9 | Failing load (as per IS:5350 Part-III/1971) | |
| a) | Upright | 9000 N |
| b) | Under-hung | 4500 N |
| c) | Tension | 20000 N |
| d) | Compression | 40000 N |
| e) | Torsion | 340 N.M. |
| 10 | Height of insulator (Min) | 254mm (Tolerance ±1mm) |
| 11 | Insulating part dia (Max) | 152 mm |
| 12 | Top metal fitting pitch circle dia | 57 mm |
| 13 | Bottom metal fitting pitch circle dia | 57 mm |
| 14 | a) No. of holes | 4 Nos. |
| | b) Bolts holes dia | 10 mm tapped holes at the top and 12 mm plain holes at the bottom. |
| | c) Nominal dia of mounting face not to exceed | 85 mm |

11.8 **Marking**: Each insulator shall be legibly and indelibly marked with the following.

a) Name or trade mark of the manufacture
b) ISI certificate mark if any

Marking shall be durable and shall be printed by the transfer process before firing.

11.9 **Type test Report of Insulator**: The type test Certificate of insulator shall be furnished test conducted at CPRI/ERDA/Any Govt NABL Laboratory

11.10 **Drawing and <u>BOM</u>:** The Typical drawing and BOM attached with this specification

**General Manager (Ele)**
**QS&S BESCOM**

**<u>GUARANTEED TECHNICAL PARTICULARS FOR 11 KV 400AMPS DOUBLE BREAK ISOLATOR (To be filled by Bidder)</u>**

| Sl. No. | Details | Bidder offer |
|---|---|---|
| I | Material | |
| 1 | Name of the manufacturer | |
| 2 | Type | |
| 3 | No. of poles | |
| 4 | Frequency | |
| 5 | Voltage Rating | |
| 6 | Current Rating in Amps<br>Normal<br>Maximum | |
| 7 | Temperature rise of the following at full rated current in O.C. over ambient temperature | |
| 8 | Whether contacts are silver coated or tin coated along with thickness of coating in mm. | |
| 9 | Voltage drop across terminals of poles | |
| 10 | Short time current and duration | |
| 11 | Material of fixed contact | |
| 12 | Material of moving blade | |
| 13 | Material of terminal connector | |
| 14 | Type Diameter and length of operating handle | |
| 15 | Materials of arcing horns | |
| 16 | Size and length of base mounting channel | |
| 17 | Whether the Air break switch is complete with all accessories | |
| 18 | Whether Dimensional drawing is enclosed with the tender | |
| 19 | Minimum clearance between phase (The center distance between the insulators of adjacent phase in the assembled position of switch) | |
| 20 | Center to center distance between insulators of the consecutive poles of the same phase in the assembled position of switch (in mm) | |
| 21 | Whether mechanical interlock has been provided for arcing switches | |

| | | |
|---|---|---|
| 22 | Type of bearings use in:<br>Rotating insulator stack.<br>To earth and between poles | |
| 23 | Impulse withstand voltage with 1/50 M.S wave positive and negative polarity. | |
| 24 | One minute power frequency withstand voltage across isolating distance Phase to earth and between poles. | |
| II | **PARTICULARS OF INSULATORS** | |
| 1 | Type of insulators | |
| 2 | Name of manufacturer of insulators | |
| 3 | Height of the insulators | |
| 4 | Diameter of the largest shell | |
| 5 | Number of units per stack | |
| III | **ELECTRICAL CHARACTERISTICS** | |
| 1 | Flash over voltage | |
| 2 | Dry power frequency | |
| 3 | Wet power frequency | |
| 4 | Impulse voltage of 1/50 micro-sec(+ve) | |
| 5 | Impulse voltage of 1/5-micro-sec(-ve) | |
| 6 | Power frequency puncture withstand voltage of unit | |
| IV | Mechanical characteristics: | |
| | Cantilever strength under upright<br>Cantilever strength under torsional<br>Torsional strength<br>Tensile Strength | |
| V | General Characteristics<br>Minimum Creepage conforms<br>Weight of complete unit | |
| VI | Standard to which insulator conforms | |
| VII | Number of Insulators per set | |

**Seal & Signature bidder/Manufacturer**